Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 191 (2015) 568 – 573

Procedia
Social and Behavioral Sciences

WCES 2014

Correlation Between Learning Methods – Understanding Degree for Optimization Techniques in Power Systems Courses

Oana Pop[a]*, Flavius Dan Surianu[a], Antheia Deacu[a], Bianca Dobre[a], Marcela Litcanu[a]

[a]*Politehnica University Timisoara, Power Systems Department, 2 Bd. V, Parvan, 300223 Timisoara, Romania*

Abstract

The manner of teaching in the case of the technical field discipline has a number of features that require the use of an appropriate learning method during the courses. One of the reasons the students seem to quickly forget what they learned is the nature of the texts they read. The aim of this study is to analyse the correlation between the conceptual developments of learning methods and how the students react during the courses. It assumes that an inadequate mode of realization and presentation of learning methods can lead to a decrease of the understanding level and learning. The following learning methods will be used: What You Think You Know / What You Want To Know/ What You Think You Know/ What You Learned Method (PLEASE CHECK THIS) (K-W-L) and Mind Mapping method. These methods are applied in Optimization Techniques in the Power Systems course. The authors performed a structuring version of the course for the K-W-L method and two variants of conceptual maps. The study was performed on three groups of students and revealed that the poor quality of achievement and presentation of learning methods can lead to the decrease of the level of understanding and learning of students. The K-W-L method is not adaptable for any course. Conceptual maps remain the preferred option because students can retain a large part of the details. The authors recommend the use of conceptual maps. However, the teacher's experience in the realization of these maps is crucial.

Selection and peer-review under responsibility of the Organizing Committee of WCES 2014

Keywords: learning methods, optimization techniques, mind mapping

1. Introduction

The reality of the classroom is that many students do not regularly read their school's reading tasks. Teachers often feel defeated by the fact that when achievement in reading a text is put into question, some students get involved, while others do not. Instead of carefully reading the text, many students use a number of typically inefficient practices

* Oana Pop. Tel.: +40-256-403-423
E-mail address: oana.pop@upt.ro

Selection and peer-review under responsibility of the Organizing Committee of WCES 2014
doi:10.1016/j.sbspro.2015.04.630

(such us: browsing for answers). Much of what is called "reading for school" (Harada, 2010) falls into this category. Students are concerned about the completion of a mission, reading the essential details, without trying to understand what the author is trying to communicate. Then, inevitably, the already familiar answer appears for the teacher: I read it, but I didn't understand it. So, the students who are not familiar with effective reading strategies are unable to learn after reading. In this case, any reading of new texts is very vulnerable and quickly forgotten. In 2007, Keene and Zimmermann (Keene, 2007; Block, 2008) presented six essential components in the process of performing a reading comprehension: making connections to prior knowledge; general questions; creating mental images; making interference; compiling; monitoring and applying fixed reading strategies. Another important issue relates to how students remember certain things that they have been previously taught. Unfortunately, for many students, the concept of learning in school represents a short-term process. They prepare every day for a constant volume of information, hoping to remember the essential things to pass the test. Then they move on to the next matter. In this case, the teacher feels discouraged when he/she observes that many students seem to retain little of what they are supposed to learn. One of the reasons that students seem to quickly forget what they learned during classes is the nature of the texts they read during classes. Sometimes texts are poorly organized and not satisfactory for students. So it is necessary for the teacher to use learning strategies (Buehl, 2009). These learning strategies, called learning methods, can be applied to both groups and individuals. Currently in the literature there are a number of learning methods, (Ogle, 1986): clusters, conceptual maps, brainstorming, what you think you know / what you want to know / what you think you know / what you learned (K-W-L) (please check as does not make sense), categorization, Lotus technique, 6-3-5 technique, Mosaic method, SWOT analysis, etc.

In this paper, the correlation between conceptual development of learning methods and how the students react during the courses are analyzed. Two learning methods will be used in Optimization Techniques in the Power Systems course: What You Think You Know / What You Want To Know/ What You Think You Know /What You Learned (K-W-L method) (Ogle, 1986) and the Mind Mapping method (Buzan, 2007). The analysis is addressed to answer the following questions:

1. Which of the two learning methods provides better results?
2. In the case of the Mind Mapping method, which of the presented schemes provided a better understanding?
3. What is the reaction of students after the method's presentation?

2. Presenting the learning method

2.1. What You Think You Know / What You Want To Know / What You Learned Method

The method was created by Ogle (Buehl, 2009; Ogle, 1986; Klingner, 2007 and it was called K-W-L (K – students use this column to write what they want to know about the subject, W – students write what they will want to know about the subject, L – students write what they were taught through their research). This method is a widely used tool to help students evaluate their project alone. It also could be used on small groups of students, or the whole class. In this case, students already know about a subject and expect to find answers on the subject. The method is one of the simplest organizing strategies for students thinking about a particular problem or subject.

The steps are as follows:

- Review in pairs, in small groups or with the whole class of all ideas related to a particular theme known in advance.
- Formulating questions for clarification and deepening knowledge.
- Building on the board of a table with the following columns:

I know	I want to know	I learned
What we think we know?	What we want to know?	What I learned?

- Reading the list made by several pairs, and notating the ideas accepted by the whole group on the board, according to the selection criteria made by the first column. It can ask questions to determine if there are things that are still unclear, things students would like to know or if there are those who still have doubts. These will be listed in the second column, 'I want to know'.
- Reading the text available for each participant and make a brief representation of the topic under discussion will be followed by sorting the ideas that will complete the three columns.

At the end of activity, it can return to the scheme 'I know', 'I want to know', 'I learned', concluding on what was learned or what can become the subject of investigation.

2.2. Conceptual Maps Method or Mind Mapping Method

This method was created by Tony Buzan in 1979, and is a type brainstorming method (Hyerle, 2008; Buzan, 2007). Conceptual maps (Payne, 2010, are graphical representations of the information, ideas and relationships. They are very useful in organizing and visualizing information, two processes that help the best remembrance of information. When the teacher makes a concept map, he/she can view the text, using their own imagination on that text and make connections that others may overlook.

Concept maps are graphical forms giving ideas of what was obtained after reading - ideas, details and the relationships between them – and then rewriting the text accordingly, using words, images and symbols as the student desires.

There are some disadvantages when using this method as the primary method of writing the main ideas after reading the material proposed. First, to make all the connections that are reported after reading, it is necessary to create several maps. As specified in (Payne, 2010) four or five maps can be created for each paragraph of the proposed material or reading each paragraph or chapter. Making multiple maps for the proposed material can be considered a waste of time and, in this situation, the quality of achieving the final map for all material and the value of the map as a study tool for students may decrease. To avoid this problem, it is recommended that this method should not be used as the primary method for taking notes. Essential steps for building a conceptual map are: the text is read carefully; it uses the page divided method in two or three columns for taking notes (the main ideas); the main ideas are selected on a paper and are arranged in order to derive one from other; draw the lines between ideas and check connection between ideas; the map is made on paper and is introduced in the Mind Map program.

In case of the primary method of taking notes, the page used for taking notes in columns is shared to simplify the process of re-reading the notes later. This method is very useful to students for exams. It can be used in two or three columns, leaving space at the end of each page for a summary of comments. The manner of taking notes through dividing the pages, consisting of two columns and three columns, respectively, is shown on Table 1 and Table 2.

Table 1. Taking notes through dividing page: two columns format

Course: Chapter-title-number pages		
Strategies for taking notes	Three methods of making notes:	
1. Highlighting	+: easy, convenient	–: mistakes, over highlighting, no notes, comments
2. Annotation	+: edges, questions, notes, erase mistakes	–: spaces on the sides, crowded, hard to read
3. Emphasis	+: paper, study without a book, follow orders of the book, focusing on reading	–: more work, inappropriate in mathematics
Annotation and highlighting are three simple examples of strategies for making notes. Each method has its positive and negative aspects.		

It starts with a blank sheet of paper (see Table 1) to take notes with or without lines and it write name of the course and the requirements on the top of the page. Then, two columns are created by drawing a vertical line from the quarter to the top of the page. The vertical line is positioned in such a way that the space from the left is about one third from width of the paper. The left column is limited to writing words or phrases that are much easier to remember. The right column of the page is for the detailed notes, to do lists, to keep track of data and to include any other factors that explain the key elements in the left column. Summary section at the bottom of the page can be used to condense and summarize what has been written above in the right column. The summary can be written too. Alternatively, the reader can decide to write the summary later after he / she has repeated and reviewed the notes.

Table 2. Taking notes through the dividing page: three columns format

Course:	Chapter-title-number pages	
Key terms	Examples	Rules or formulas
Abstract		

The method with three columns is presented in Table 2. This method is the most commonly used for taking notes in mathematics and sciences and laboratory notes, to more easily distinguish between keywords and concepts, examples, rules and formulas. The three-column format may include a summary section at the bottom of each page, which can be used to synthesize processes or formulas for revision and subsequent repetition. Due to the large volume of numbers, equations, symbols, and calculations used in mathematics, chemistry or physics there is the possibility that the student may not recognize exactly how or what was noted if it was not clearly distinguished and labeled material in the notes.

3. Presenting the case study

3.1. The research hypothesis

The assumption on which the study is based is how inadequate achievement and presentation of learning methods can decrease the understanding and learning levels of students.

3.2. Participants

Participants in the study are students in the 4th year of the Power System Department from the Politehnica University Timisoara, Romania. The average age is 22 years. Participants were divided into three seminar groups of 17 students.

3.3. Instruments

The content material used is divided into three parts: the convention used to determine the Hamiltonian path in case of a company, Foulkes algorithm and a numerical application. It should be noted that for reasons of space the calculation relation has not been introduced. The What You Think You Know / What You Want To Know What You Think You Know/ What You Learned (K-W-L) Method was done in Word (Fig. 1) and inserted into PowerPoint. Conceptual maps were created in the MindJet program and saved in Acrobat Reader (Figs. 2 and 3). They were presented with a laptop and video projector. Fig. 4 contains a numerical application that will be resolved by the teacher on the board in all three situations.

I KNOW	I WANT TO KNOW	I LEARNED
Overhead power lines Transmission costs Theoretical notions about matrix Matrix operations	*Company presentation:* Company - Knowledge of power lines: Transmission costs;, the order to achieve the lines - Conventions of representation: construction site-peak graph, railways links - arcs graph, transmission distance - values arcs *Foulkes algorithm:* Step 1: Decomposition of graph G; Write matrix B and B + 1; Calculation of successive powers - helping matrix; Order the line of matrix; Analysis of matrix; Existing Hamiltonian paths; Establishing the peaks equivalence class peaks; Representing of graphics – equivalence class; Tracing arcs Step 2: Determination of Hamiltonian path; Determining Hamiltonian path value	Conventions - real company - Hamiltonian path identification of Foulkes algorithms steps Application of notions to solve numerical applications

Fig. 1. Method K-W-L

3.4. Procedure

The material which contains the method What You Think You Know / What You Want To Know / What You Think You Know /What You Learned was presented to the first group. Conceptual map 1, shown in Fig. 2, is shown in group 2 and the conceptual map 2 from Fig. 3 is applied to the last group.

4. Results and interpretation

For the first seminar group, the teacher considered that students were already familiar with the theoretical part, given that it had already been taught during the course. But he found that the students had difficulty in understanding the support material due to the large number of notions, representation conventions and relationships. For, example, students did not know notions as peaks, graph branches, or branch values. Many questions were formulated and problem-solving time was significantly reduced. For the other two seminar groups, the teacher used the board to note the representation convention, relationship and primary ideas. The conceptual map presented in Fig. 2 was presented to the second group. After presenting the theoretical notions, the teacher proceeded to solve the numerical application using the board. But, the conceptual map did not contain all the steps required to solve the numerical application, which led to a large number of questions. The teacher was forced to interrupt the application from the start and return to explaining in detail the two steps of the Foulkes algorithm. For this reason, part of the time allocated to solve the problem was lost. In the last situation, the teacher used the conceptual map presented in Fig. 3. This map contains all the information needed to solve the problem. This map and additional explanatory notes written on board lead to a better understanding from the students. The number of questions decreased and the teacher was able to reach all the goals.

5. Conclusions

This analysis confirmed the hypothesis that the degree of understanding and learning is significantly reduced in the case of inadequate achievement and presentation of learning methods. The results of this analysis lead to several conclusions. The What You Think You Know / What You Want To Know/ What You Think You Know What You

Learned Method is not adaptable for any course support. Another problem is that it is expensive in terms of time. Conceptual maps remain the preferred option because the students can retain many of the details. However, the experience of the teacher in creating these maps is crucial. Also, the inadequate way of achieving and presenting learning methods can decrease the level of understanding and learning of students. Therefore, the teacher will not be

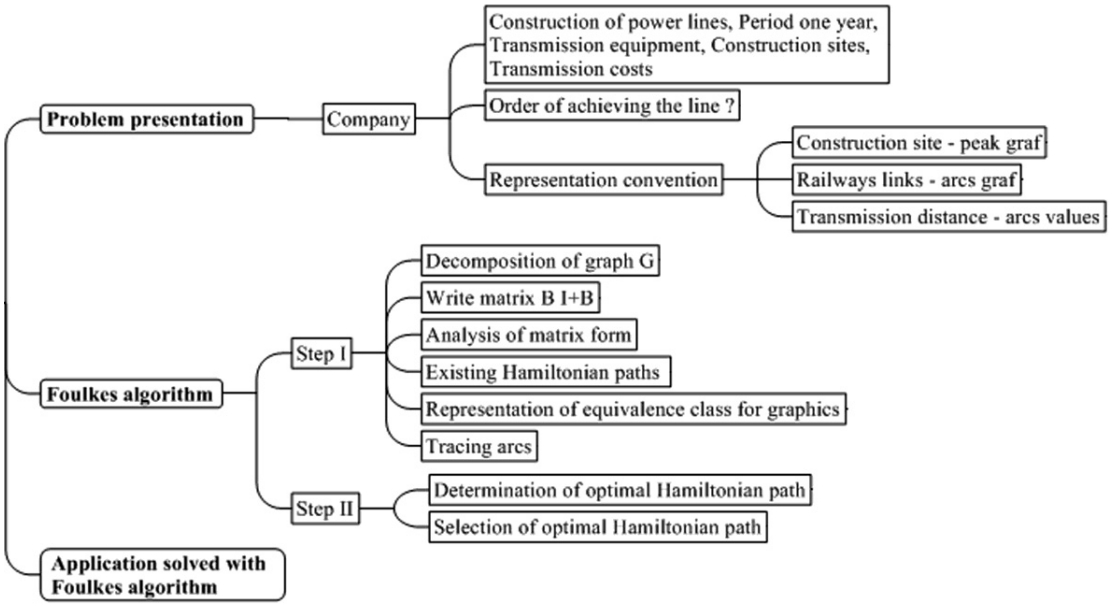


Fig. 2. Conceptual map 1

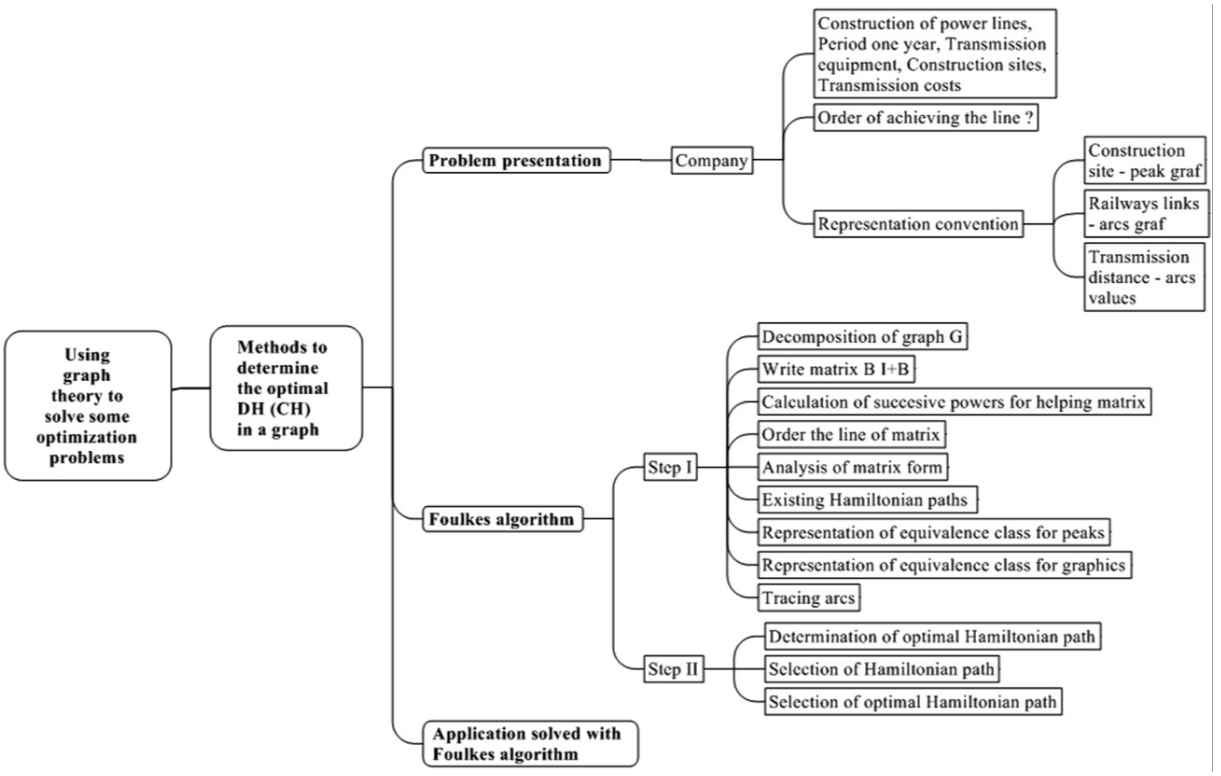
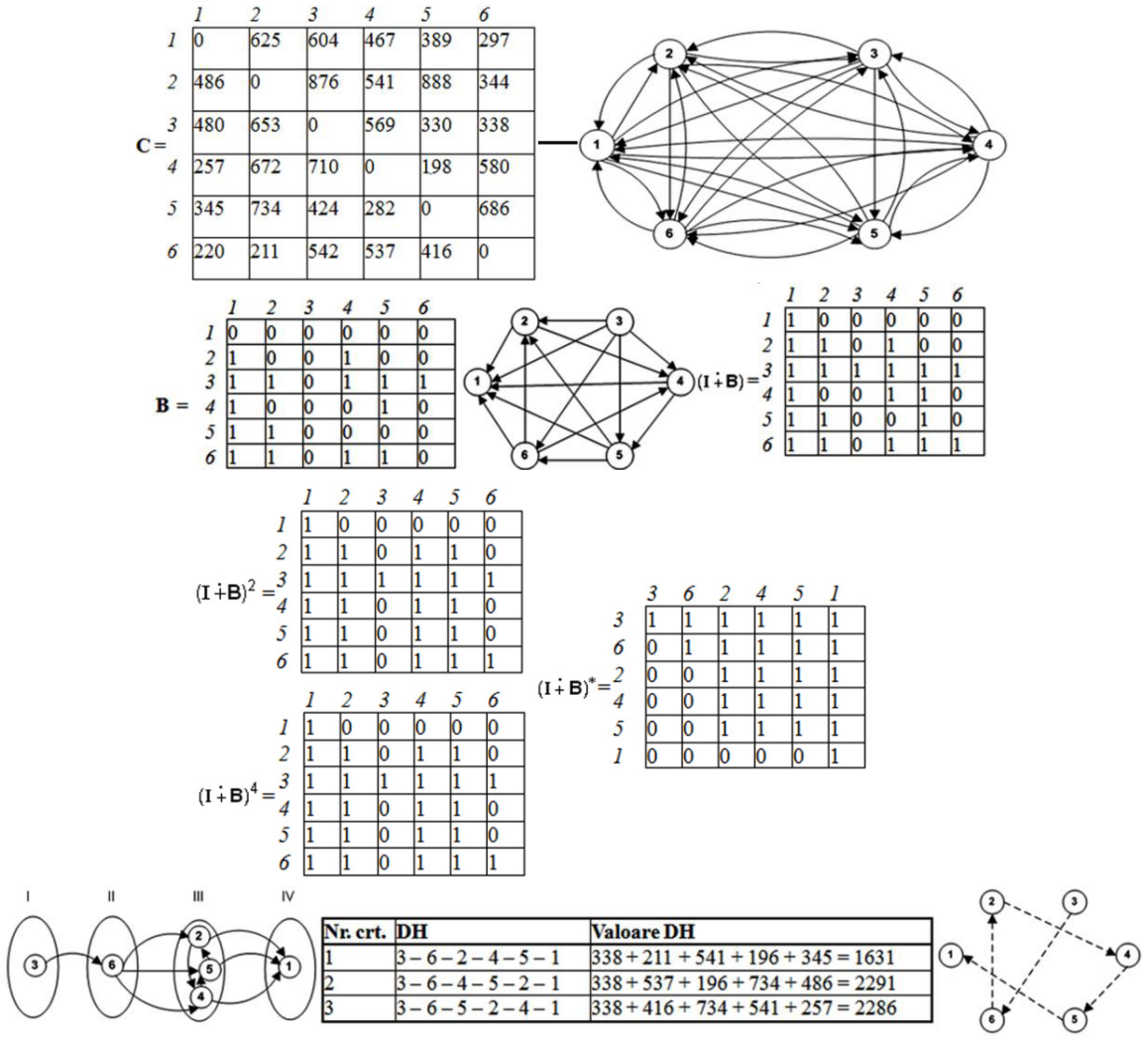


Fig. 3. Conceptual map 3



Nr. crt.	DH	Valoare DH
1	3 – 6 – 2 – 4 – 5 – 1	338 + 211 + 541 + 196 + 345 = 1631
2	3 – 6 – 4 – 5 – 2 – 1	338 + 537 + 196 + 734 + 486 = 2291
3	3 – 6 – 5 – 2 – 4 – 1	338 + 416 + 734 + 541 + 257 = 2286

Fig. 4. Conceptual map synthesized to solve numerical application

able to perform a large number of proposed objectives in the teaching process. The authors propose a way of teaching in the case of technical disciplines, especially the Optimization Techniques in Power Systems courses, using conceptual map methods. In addition to the necessary experience in realization of these maps, the teacher should avoid using this method as a primary method of taking notes. Essential ideas may be omitted, but students may have difficulty in understanding the theoretical concepts, especially when the course support contains computing algorithms.

References

Block, C.C. & Parris, S.R. (2008). Comprehension Instruction: Research-Based Best Practices, Guilford Press.

Buehl, D. (2009). Classroom Strategies for Interactive Learning, 3rd ed., International Reading Association.

Buzan, T. & Buzan, B. (2007). The Mind Map Book, Pearson Education.

Harada, V.H. & Yoshina, J.M. (2010). Assessing for Learning: Librarians and Teachers as Partners, ABC-CLIO.

Hyerle, D. (2008). Visual Tools for Transforming Information Into Knowledge, Corwin Press.

Keene, E.O.,& Zimmermann, S. (2007). Mosaic of thought: The power of comprehension strategy instruction, 2nd ed., Portsmouth: Heinemann.

Klingner, J.K., Vaughn, S. & Boardman (2007). A. Teaching Reading Comprehension to Students with Learning Difficulties, Guilford Press.

Ogle, D. (1986). K-W-L: A teaching model that develops active reading of expository text, *Reading Teacher, 39*, 564-570.

Payne, E. & Whittaker, L. (2006). Developing Essential Study Skills, Pearson Education.